IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of: Sture Helmersson et al.	) Examiner: Boyd, Erin M.
	) Confirmation No. 1735
Title: A Spacer and a Fuel Unit for a Nuclear Plant	)
	) Art Unit: 3663
Serial No.: 10/586,032	)
Filed: July 13, 2006	) (Docket No. 1026-0006WOUS)

Middletown, Connecticut, December 2, 2010

U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

REVISED APPEAL BRIEF

Dear Sir:

This Revised Appeal Brief is respectfully submitted in response to the Notification of Non-Compliant Appeal Brief mailed on November 8, 2010. A response to the Notification is due on or before December 8, 2010. Appellants' original Appeal Brief was filed on November 2, 2010 following the Notice of Appeal filed by the Appellants on November 1, 2010.

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The items required by 37 CFR 41.37 (c)(1) are set forth herein beginning on the following pages, respectively:

(i) REAL PARTY IN INTEREST

The real party in interest is Westinghouse Electric Sweden AB, the assignee of record.

(ii) RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences directly related to the present appeal.

(iii) STATUS OF CLAIMS

Claims 28, 30, 31, 33, 34, 36-48, 50-52, and 54-57 are pending and are appealed. Claims 1-27, 29, 32, 35, 49 and 53 are canceled.

(iv) STATUS OF AMENDMENTS

On July 21, 2010, Appellants filed a Request for Continued Examination (RCE) together with a response to the Final Office Action mailed April 30, 2010. In the response, Claims 28, 34 and 57 were amended. A Final Office Action (referred to hereinafter as the "Office Action") was mailed August 16, 2010 and states the amendments submitted on July 21, 2010 were entered. Accordingly, the Claims on appeal include the amendments submitted in Appellants' response of July 21, 2010.

(v) SUMMARY OF CLAIMED SUBJECT MATTER

The instant patent application discloses and claims a fuel unit for a nuclear plant that includes a number of elongated fuel rods and a number of spacers for holding the fuel rods. Each fuel unit comprises a large number of elongated fuel rods. The fuel rods are maintained in a proper position in the fuel unit by means of the spacers. The spacers hold the fuel rods in a correct position in the fuel unit and also have the function to ensure the maintaining of a constant mutual distance between the fuel rods during the operation of the reactor. *See* Summary in Specification as filed.

As stated in the Specification on p. 4, there are several considerations that should be factored in when designing a spacer and employing such a fuel unit. For example, a sufficient abutment surface to the fuel rod is an important consideration to minimize wear and risk for defect. Furthermore, it is important that the spacer has a sufficient mechanical strength for meeting this requirement. The strength is also important for reducing the bending and vibration of the fuel rods, and for resisting large thermal and hydraulic forces. Furthermore, a sufficient spacer should have an ability to withstand axial and radial dimension changes of the fuel rods.

Thanks to the feature that each of the elongated abutment surfaces extends from a respective one of said wave peaks of the upper edge to a respective one of the wave peaks of the lower edge, the spacer according to the present invention provides an abutment surface which has an axial extension that is optimized with respect to the length thereof and thus will ensure a long axial abutment line against the fuel rod extending through the sleeve. Specification at p. 5

By such a long abutment, a small wear of the cladding tube of the fuel rod is achieved. Furthermore, each such sleeve has, on each side of each abutment surface, i.e., at the wave valleys, a significantly shorter extension than at the abutment surfaces and the wave peaks. This means that the axial extension between the abutment surfaces, i.e., from the wave valley at the lower edge to the corresponding wave valley at the upper edge, is relatively short. This difference in the length of the axial extension between the abutment surfaces and the areas between the abutment surfaces is important to give the sleeve of the spacer a flexibility so that the sleeve at the abutment surfaces may move radially inwardly and outwardly to meet radial dimension changes, and also to permit the abutment surfaces to rotate slightly around a

center point in a radial plane. This small rotation gives the sleeve of the spacer a flexibility to meet slight inclinations and variation in the inclinations of the fuel rods during operation of the nuclear plant. A further consequence of this is that the sleeve of the spacer will ensure a uniform proper abutment against the fuel rod along the whole length of the abutment surface also in case the fuel rod is bent or in case other axial, and/or radial dimension changes of the fuel rod would occur. Specification at pp. 5-6.

Independent claim 28 is directed to a spacer 30 (para. [0047], FIGS. 2-5) for holding a number of elongated fuel rods 5 intended to be located in a nuclear plant, the spacer 30 enclosing a number of cells 31 (paras. [0046] and [0050], FIGS. 2, 3 and 5), each cell having a longitudinal axis x and arranged to receive a fuel rod 5 in such a way that the fuel rod 5 extends substantially in parallel with the longitudinal axis x (para. [0050]-[0051], FIGS. 5-7), each cell 31 being formed by a sleeve 32, having an upper edge 33 and a lower edge 34 (para.[0051]-[0052] FIGS. 5-9), the sleeve 32 including a number of elongated abutment surfaces 35, which project inwardly towards the longitudinal axis x and extend substantially in parallel with the longitudinal axis x for abutment to the fuel rod 5 to be received in the cell 31 (para. [0051], FIGS. 6-9), and the lower edge 34, seen transversely to the longitudinal axis x, having a wave shape with wave peaks 36, which are aligned with a respective one of said abutment surfaces 35, and wave valleys 37 located between two adjacent ones of said abutment surfaces 35 (para. [0052], FIGS. 6 and 8); wherein the upper edge 33, seen transversely to the longitudinal axis x, has a wave shape with wave peaks 36, which are aligned with a respective one of said abutment surfaces 35, and with wave valleys 37 located between two adjacent ones of said abutment surfaces 35 (para. [0052], FIGS. 6 and 8), each of said elongated abutment surfaces 35 extending from a respective one of said wave peaks 36 of the upper edge 33 to a respective one of said wave peaks 36 of the lower edge 34 (para. [0052], FIGS. 6 and 8), and the sleeves 32 abut each other in the spacer 30 along respective connection areas (para. [0054] FIG. 5), each extending substantially parallel to the longitudinal axis x between one of said wave valleys 37 of the upper edge 33 and one of said wave valleys 37 of the lower edge 34 (para. [0054], FIG. 5).

Independent claim 57 is directed to a fuel unit 20 for a nuclear plant including a number of elongated fuel rods 5 and a number of spacers 30 for holding the fuel rods 5 (para. [0047]-[0048], FIG. 2), wherein each of the spacers 30 enclose a number of cells 31, which each have a longitudinal axis x and is arranged to receive one of said fuel rods 5 in such a

way that the fuel rod 5 extends in parallel to the longitudinal axis x (para. [0050], FIGS. 5-7), each cell is formed by a sleeve 32, which has an upper edge 33 and a lower edge 34, the sleeve 32 includes a number of elongated abutment surfaces 35, which project inwardly towards the longitudinal axis x and extend substantially in parallel with the longitudinal axis x for abutment to the fuel rod 5 to be received in the cell 31 (para. [0051]-[0052], FIGS. 6-9); the lower edge 34, seen transversely to the longitudinal axis x, has a wave shape with wave peaks 36, which are aligned with a respective one of said abutment surfaces 35, and wave valleys 37 located between two adjacent ones of said abutment surfaces 35 (para. [0052], FIGS. 6 and 8); wherein the upper edge 33, seen transversely to the longitudinal axis x, has a wave shape with wave peaks 36, which are aligned with a respective one of said abutment surfaces 35, and with wave valleys 37 located between two adjacent ones of said abutment surfaces 35 (para. [0052], FIGS. 6 and 8), each of said elongated abutment surfaces 35 extending from a respective one of said wave peaks 36 of the upper edge 33 to a respective one of said wave peaks 36 of the lower edge 34 (para. [0052], FIGS. 6 and 8), and the sleeves 32 abut each other in the spacer 30 along respective connection areas (para. [0054], FIG. 5), each extending substantially parallel to the longitudinal axis x between one of said wave valleys 37 of the upper edge 33 and one of said wave valleys 37 of the lower edge 34 (para. [0054], FIG.5).

Dependent claim 38 recites "means of at least one weld joint" which is discussed at least at paragraph [0054] of the application, which recites "[e]ach such weld joint includes an edge weld at said connection area at at least one of the upper edge 33 and the lower edge 34."

As described in the application, the spacer 30 encloses a number of cells 31, which each has a longitudinal axis x. *See* FIG. 6. Longitudinal axis x extends substantially vertically when the fuel unit 20 is located in a reactor. The fuel rod 5 extends in parallel with the longitudinal axis x. *See* Specification as filed at para. [0050].

As shown in FIGS. 6-9, each cell 31 is formed by a sleeve-like member 32, which has an upper edge 33 and a lower edge 34. The sleeve-like member 32 includes elongated abutment surfaces that are adapted to abut the fuel rod 5. In the embodiments disclosed, the abutment surfaces are formed by four elongated ridges 35 projecting inwardly towards the longitudinal axis x and to the fuel rod 5 extending through the cell 31. *See* Specification as filed at para. [0051].

Each ridge 35 extends substantially in parallel with the longitudinal axis x along substantially the whole length of the sleeve-like member 32 from the upper edge 33 to the lower edge 34. *See* Specification as filed at para. [0051] and FIGS. 6 and 8.

The upper edge 33 and the lower edge 34 have, seen transversely to the longitudinal axis x, a wave-like shape with wave peaks 36 and wave valleys 37. *See* Specification as filed at para. [0052] and FIGS. 6 and 8, which are reproduced below for convenience:

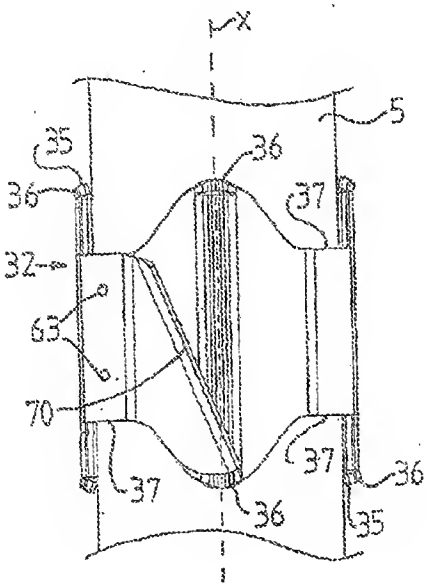


Fig 6

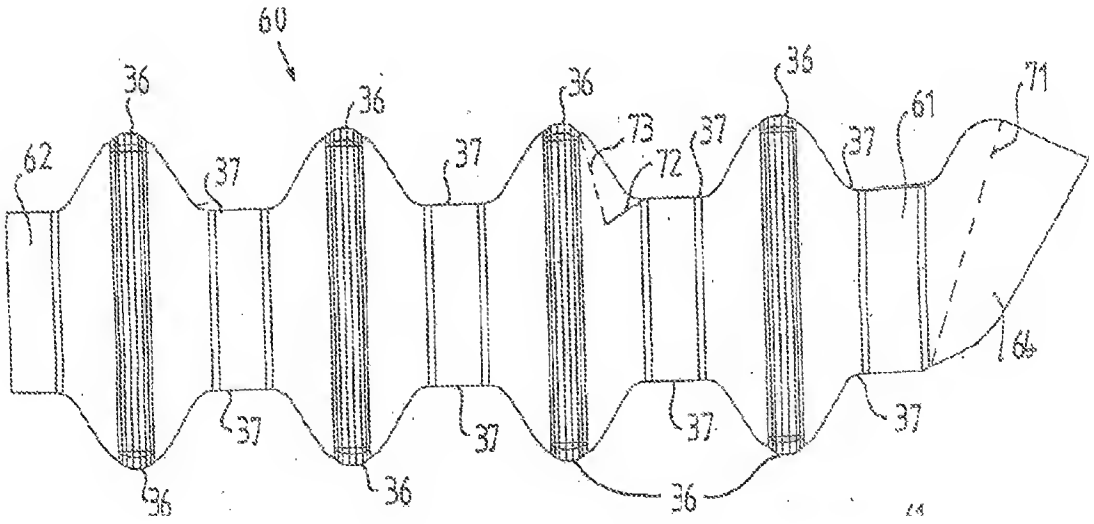


Fig 8

As can be seen in at least FIGS. 6 and 8, the wave peaks 36 of the upper edge 33 are aligned with a respective wave peak 36 of the lower edge 34 and with a respective one of the ridges 35. The wave valleys 37 of the upper edge 33 are aligned with a respective wave valley 37 of the lower edge 34. The wave valleys 37 are located between two adjacent ridges 35.

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Whether Claims 28-34, 36, 40-43, 47, 54 and 57 are unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 5,875,223 to Nylund (hereinafter referred to as "Nylund") in view of U.S. Patent No. 5,331,679 to Hirukawa (hereinafter referred to as "Hirukawa").

II. Whether Claims 37, 38 and 39 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of U.S. Patent No. 6,901,128 to Mori et al. (hereinafter referred to as "Mori et al.").

III. Whether Claims 48 and 51 are unpatentable under 35 U.S.C. §103(a) over Nylund, Hirukawa, and Mori et al. as applied to Claim 37 and further in view of U.S. 5,272,741 to Masuhara et al. (hereinafter referred to as "Masuhara et al.").

IV. Whether Claims 44-46 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa, as applied to Claim 28 and further in view of U.S. Patent No. 4,800,061 to Shallenberger et al. (hereinafter referred to as "Shallenberger et al.").

V. Whether Claims 50 and 52 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of Masuhara et al.

VI. Whether Claims 55 and 56 are unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of U.S. Patent No. 5,778,035 to Nylund (hereinafter referred to as "Nylund (2)").

(vii) APPELLANTS' ARGUMENTS

I. Rejection of Claims 28, 30, 31, 33, 34, 36, 40-43, 47, 54 and 57 under 35 U.S.C. 103(a) over Nylund in view of Hirukawa

Claims 28, 30, 31, 33, 34, 36, 40-43, 47, 54 and 57 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent No. 5,875,223 to Nylund (hereinafter referred to as "Nylund") in view of U.S. Patent No. 5,331,679 to Hirukawa (hereinafter referred to as "Hirukawa").

A. Claims 28, 30-34, 36, 40-43, 47, 54 and 57

Regarding independent claims 28 and 57, the Examiner states that Nylund "fails to teach that the upper edge, seen transversely to the longitudinal axis, has a wave with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces, and that the connection areas extend substantially parallel to the longitudinal axis between one of the wave valleys lower edge and one of the wave valleys of the upper edge." Office Action at pp. 3, 12 and 13.

However, the Examiner states that the lack of disclosure in Nylund is remedied by Hirukawa since, according to the Examiner, "Hirukawa teaches a sleeve-like member 12d wherein the upper edge, seen transversely to the longitudinal axis, has a wave with wave peaks 21b, which are aligned with a respective one of said abutment surfaces 13a, and with wave valleys 22 located between two adjacent ones of said abutment surfaces 13a (figure 13)." *See* Office Action, pp. 3-4. The Examiner states "[a] motivation for constructing the sleeve to have a wave with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces at the upper edge of said sleeve is to provide a guide for the smooth insertion of the fuel rod into the fuel space (Hirukawa; column 9, lines 46-51)." Office Action at p. 4.

Based on the alleged motivation supplied by Hirukawa, the Examiner concludes that it would have been obvious to one skilled in the art "to construct the sleeve to have a wave with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces at the upper edge of said sleeve." Office Action at pp. 4 and 13.

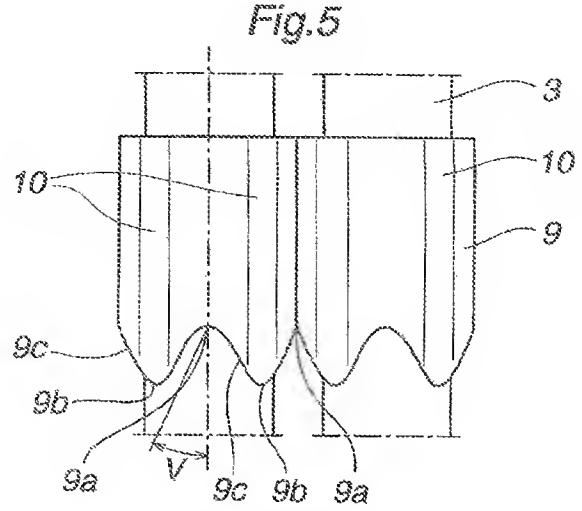
Appellants respectfully disagree that one of skill in the art would be motivated to combine Nylund and Hirukawa since Nylund "relates to an alternative way of reducing the risk of wear on the fuel rods caused by foreign matter adhering to the upstream edge of the spacer" while Hirukawa "provide[s] a fuel spacer for a fuel assembly capable of achieving a reduced pressure loss of the fuel spacer and improving the limit power output of the fuel assembly." *See* Nylund at col. 1, lines 56-58 and Hirukawa at col. 1, line 67 to col. 2, line 2. Accordingly, one skilled in the art reviewing Nylund, and thus interested in reducing wear of the fuel rods due to foreign debris, would not seek guidance or modification from Hirukawa, which relates to reducing pressure loss and improving the limit power output of the fuel assembly.

Moreover, even if one skilled in the art would combine Nylund and Hirukawa, a fact not conceded by Appellants, such a combination would still fail to disclose, suggest or even hint of the instantly claimed invention.

Nylund discloses, *inter alia*, a design of a spacer for retaining elongated elements in a fuel assembly for a light-water nuclear reactor. More particularly, the invention disclosed in Nylund relates to the design of a spacer sleeve for such a spacer. *See* col. 1, lines 6-9. The invention of Nylund relates to "an alternative way of reducing the risk of wear on the fuel rods caused by foreign matter adhering to the upstream edge of the spacer." *See* col. 1, lines 56-58.

According to Nylund, the "reduced risk of wear on the fuel rods by foreign matter is achieved by an alternative design of already known spacers. The invention is applicable to already-known spacers of the type comprising a grid structure of sleeves. By designing the upstream edge of such spacers with a wavy form, foreign matter captured towards the upstream edge of the spacer may be oriented such that it will not make contact with the elongated fuel rods positioned by the spacer." Nylund at col. 1, line 61 to col. 2, line 2.

FIG. 5 of Nylund illustrates a spacer with the upstream edge having a wavy form. FIG. 5 is reproduced below for convenience:



In contrast to Nylund, Hirukawa discloses a fuel spacer for a fuel assembly. An object of Hirukawa's invention is to "substantially eliminate defects or drawbacks encountered in the prior art . . . and to provide a fuel spacer for a fuel assembly capable of achieving a reduced pressure loss of the fuel spacer and improving the limit power output of the fuel assembly." Nylund at col. 1, line 65 to col. 2, line 2.

According to Hirukawa, the object of the invention can be achieved "by providing a fuel assembly comprising: a plurality of tubular ferrules each forming a fuel rod insertion passage in which a fuel rod is inserted; a support means in the shape of belt for supporting a periphery of the tubular ferrules bundled in a lattice arrangement; and a spring means for axially supporting the fuel rods disposed in the ferrules, wherein each of the tubular ferrules has a cylindrical wall to which an inward projection is formed to support the fuel rod, adjoining ferrules are joined together horizontally, each of the ferrules having at least one end to which a plurality of cutout portions are formed circumferentially of the end portion, and flat portions being formed in some of cutout portions, and the adjoining ferrules being spot welded to each other at flat portions thereof." Hirukawa at col. 2, lines 3-21.

Independent Claims 28 and 57 of the instant application include a spacer having, *inter alia*, cells, each cell being formed by a sleeve, having an upper edge and a lower edge, the sleeve including a number of elongated abutment surfaces, which project inwardly towards

the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received in the cell, and the lower edge, seen transversely to the longitudinal axis, having a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces; wherein the upper edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces, each of said elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge.

As recited in independent Claims 28 and 57, and clearly shown in FIGS. 6 and 8 of the instant application, the wave peaks on the lower edge of the sleeve are aligned with wave peaks on the upper edge of the sleeve. Likewise, as recited in the instant Claims and clearly shown in FIGS. 6 and 8, the wave valleys on the lower edge of the sleeve are aligned with wave valleys on the upper edge of the sleeve. The inwardly projecting abutment recited in the instant Claims runs along the length of the spacer and extends from a wave peak on the lower edge of the sleeve to a wave peak on the upper edge of the sleeve.

Neither Nylund nor Hirukawa, taken separately or in any combination, disclose or suggest the instantly claimed invention. Firstly, as recognized by the Examiner, Nylund "fails to teach that the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces, and that the connection areas extend substantially parallel to the longitudinal axis between one of the wave valleys lower edge and one of the wave valleys of the upper edge." Office Action at p. 3. Additionally, while Nylund might show that the sleeves are connected to each other along a connection area extending from the upper edge to the lower edge, Nylund fails to disclose or suggest that the connection areas extend between one of the wave valleys of the upper edge and one of the wave valleys of the lower edge, as recited in the instant Claims.

Additionally, and in contrast to the assertions of the Examiner, Appellants submit that Hirukawa also fails to disclose or suggest a sleeve having an upper and lower edge, the upper edge, seen transversely to the longitudinal axis, has a wave-like shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces, and that the connection areas

extend substantially parallel to the longitudinal axis between one of the wave valleys lower edge and one of the wave valleys of the upper edge, as recited in the instant Claims.

While Hirukawa refers to a plurality of different embodiments of sleeve designs, none of the embodiments disclose or suggest a sleeve as recited in the instant Claims. In the Office Action, the Examiner discusses the embodiment illustrated in Hirukawa's FIG. 13, which is reproduced below for convenience:

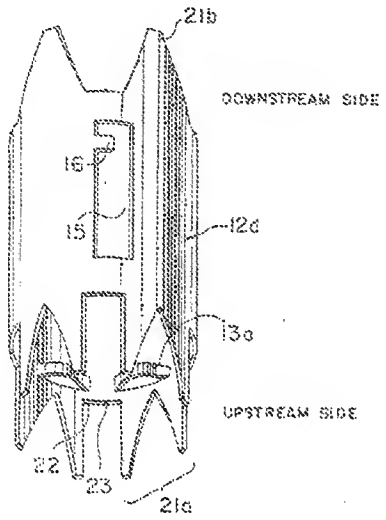


FIG. 13

FIG. 13 of Hirukawa shows petal portions 21b (what the Examiner calls "wave peaks") and flat bottom portions 22 (what the Examiner calls "wave valleys") at the upper edge of the sleeve, and petal portions 21a on the lower edge of the sleeve. However, it is clear from FIG. 13 that the petal portions 21b are trapezoidal in shape, while the petal portions 21a are either "M-shaped" or "V-shaped." *See also* Hirukawa at col. 9, lines 35-40. As such, the "peaks" and "valleys" shown in FIG. 13 of Hirukawa are located at different distances from each other and are of different shapes.

For instance, it can been seen in FIG. 13 of Hirukawa that every second "valley" has a rectangular shape, whereas every second "valley" located therebetween has more of a triangular shape. Thus, the petal portions and flat bottom portions of Hirukawa referred to as "peaks" and "valleys" by the Examiner are not wave peaks and wave valleys at all, but rather are different and irregular, geometric designs. As such, it cannot be asserted that Hirukawa

discloses a sleeve having a wave shaped upper and lower edge, as recited in the instant claims.

Appellants also note that FIG. 13 of Hirukawa shows only two "peaks," which are both of triangular shape and located relatively close to each other. It does not appear from FIG. 13 that there would be such "peaks" also at the rear side of the sleeve.

Furthermore, an important difference between the instantly claimed sleeve and the sleeve disclosed in Hirukawa is that the "peaks" at the upper edge of the sleeve of Hirukawa are not aligned with the "peaks" at the lower edge of the sleeve. That is, if a line is drawn between one "peak" at the upper edge and the closest "peak" at the lower edge, this line will not be parallel with the longitudinal axis of the sleeve, which is required in sleeve of the instant Claims.

Additionally, the sleeve illustrated and described in Hirukawa does not show elongated abutment surfaces extending from the upper edge to the lower edge as recited in the instantly presented Claims. Instead, Hirukawa teaches small abutment surfaces formed by projections 13a and 13b. As shown in the FIGS. of Hirukawa, the projections 13a and 13b do not extend from the upper edge of the sleeve to the lower edge of the sleeve.

While the Examiner confirms this in the Office Action and states "Nylund and Hirukawa fail to independently teach an elongated abutment surface extending from one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge and the connection area extending between the wave valley of the sleeve's upper edge . . ." the Examiner argues that the combination of Nylund and Hirukawa suggests such a limitation.

Appellants respectfully disagree that the combination of Nylund and Hirukawa discloses or suggests an elongated abutment surface extending from a wave peak of the upper edge of a sleeve to a respective wave peak of the lower edge of the sleeve as recited in the instant claims. This is especially in view of the fact that neither of the cited references discloses or suggests wave shapes on both the upper and lower edges of a sleeve. Therefore, to obtain the sleeve in the instant claims by combining the cited art, one skilled in the art would have to undergo a multi-step process to modify the prior art. Such multi-step process is indicative of the non-obviousness of the instant claims.

As a first step, one of skill in the art would first have to modify the sleeves disclosed in the cited references to include wave shapes on both edges. As discussed above, there is no motivation in either reference, taken separately or in any combination, to construct a sleeve having wave shapes on both edges of the sleeve.

As a second step, one skilled in the art would then have to modify the sleeve such that the wave shape of the upper edge was aligned with the wave shape on the lower edge, *i.e.,* a wave peak on the upper edge is aligned with a wave peak on the lower edge. There is simply no motivation in either reference, taken alone or together, that teaches or suggests such a configuration. In fact, Appellants submit that Hirukawa actually teaches away from such a configuration since Hirukawa illustrates and teaches utilizing different geometric shapes to form the petal portions and flat portions on each edge of the sleeve.

As a third step, one skilled in the art would next have to determine whether an abutment should extend the length of the sleeve (like Nylund) or should be shortened (like Hirukawa). Since both of the cited references teach absolutely different, and in fact opposite, embodiments, with neither reference suggesting anything but what it actually discloses, Appellants respectfully submit that Nylund and Hirukawa teach away from each other. As such, Appellants contend that one skilled in the art would either be confused about which length of abutment should be used on the modified sleeve, or would select either the elongated abutment or the shortened abutment. Since there are multiple solutions to this step, it simply cannot be said that the cited references motivate one skilled in the art to construct a sleeve having an abutment that extends the length of the sleeve.

After successfully overcoming the above mentioned steps, a fact the Appellants disagree would occur, one skilled in the art would then need to modify the abutments such that each abutment would extend from a wave peak of the upper edge to a wave peak of the lower edge. Since neither reference discloses or suggests wave shapes on both edges of a sleeve, Appellants submit that neither reference could possibly disclose or suggest aligning each abutment such that they extend from a wave peak of the upper edge to a wave peak of the lower edge. In fact, Appellants submit that Hirukawa actually teaches away from this claim limitation since there is no apparent connection between the outer shape of the circular-cylindrical sleeve having "peaks" at the upper edge and the lower edge and the shape and configuration of the abutment surfaces in the sleeve of Hirukawa. Indeed, the "peaks" of the

upper and lower edges of Hirukawa have no apparent significance for the abutment surfaces or for the abutment of the sleeve against the outer surface of the fuel rod provided therein.

Based on the foregoing remarks, Appellants submit that none of the cited references, taken separately or in any combination, teach or suggest Claims 28 and 57 and the Claims dependent therefrom. Appellants respectfully request withdrawal of the instant rejection.

B. Claims 29 and 32

Claims 29 and 32 stand rejected under 35 U.S.C §103(a). However, as mentioned in the response of July 21, 2010, Claim 29 was previously canceled by Appellants and therefore is no longer pending. Likewise, Claim 32 was previously canceled. Accordingly, Appellants maintain the rejection of Claims 29 and 30 is moot and request withdrawal of the same.

II. Rejection of Claims 37, 38 and 39 under 35 U.S.C. §103(a) over Nylund and Hirukawa and further in view of Mori et al.

Claims 37, 38 and 39 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Nylund, Hirukawa as applied to Claim 28 and further in view of U.S. Patent No. 6,901,128 to Mori et al. (hereinafter referred to as "Mori et al.").

In the Office Action, the Examiner states that Nylund teaches a spacer, "but fails to teach that the sheet-shaped material before said bending has a first connection portion in the proximity of the a [sic] first end of the sheet-shaped material and a second connection portion in the proximity of a second end of the sheet-shaped material, wherein the first end overlaps the second end of the sleeve after said bending" as required in instantly presented Claim 37. Office Action at p. 14. However, the Examiner remedies Nylund's lack of disclosure by combining Nylund with Mori et al.

According to the Examiner, Mori et al. "teaches that a sheet-shaped material (figure 23) before said bending has a first connection portion [see FIG. B] in the proximity of the a [sic] first end of the sheet-shaped material and a second connection portion [see FIG. B] in the proximity of a second end of the sheet-shaped material, wherein the first end overlaps the second end of the sleeve after bending." Office Action at p. 14. The Examiner concludes it would have been obvious to one skilled in the art to construct a spacer such that the sheet-shaped material before bending the material has a first connection portion in the proximity of

the first end of the sheet-shaped material and a second connection portion on the proximity of a second end of the sheet-shaped material, wherein the first end overlaps the second end of the sleeve after the bending. Office Action at p. 15.

Appellants respectfully disagree.

Claim 37 depends directly from Claim 28 while Claim 38 depends from Claim 37 and Claim 39 depends from Claim 38. Accordingly, Claims 37-39 include the limitations recited in independent Claim 28. As discussed in detail above, all of the limitations of Claim 28 are not disclosed or suggested by Nylund and Hirukawa, taken alone or in any combination. Appellants submit that Mori et al. does not remedy the lack of disclosure in Nylund and/or Hirukawa with respect to the limitations recited in Claim 28. As such, Appellants submit that the combination of Nylund, Hirukawa and Mori et al. fail to teach or suggest instantly presented Claims 37-39. Accordingly, Appellants respectfully request withdrawal of the instant rejection.

III. Rejection of Claims 48 and 51 under 35 U.S.C. §103(a) over Nylund, Hirukawa, Mori et al. and Masuhara et al.

Claims 48 and 51 are rejected as allegedly unpatentable under 35 U.S.C. §103(a) over Nylund, Hirukawa, and Mori et al. as applied to Claim 37 and further in view of U.S. 5.272,741 to Masuhara et al. (hereinafter referred to as "Masuhara et al.").

In the Office Action, the Examiner states that Mori et al. teaches a first connection portion, but fails to teach a vane that is formed extending from said portion. Office Action at p. 17. However, the Examiner remedies Mori et al.'s lack of disclosure by combining the reference with Masuhara et al.

Specifically, the Examiner states "Masuhara et al. teaches that a vane 8 for influencing coolant flow formed by a portion of the material. Examiner notes that if the sleeve of Masuhara et al. 7 is constructed by a folding sheet, like that taught in Mori et al., then the vane would extend from the first connection portion since the sleeve is constructed of a single sheet." Office Action at p. 17. The Examiner concludes the instantly claimed invention would have been obvious to one of ordinary skill in the art in view of the combination of all the cited references.

Appellants respectfully disagree.

Claim 48 depends from Claim 37, which in turn depends from claim 28. Claim 51 depends from Claim 48. Accordingly, Claims 48 and 51 all include the limitations recited in independent Claim 28.

As discussed in detail above, all of the limitations of Claim 28 are not disclosed or suggested by Nylund and Hirukawa, taken alone or in any combination. As discussed above, Appellants submit that Mori et al. does not remedy the lack of disclosure in Nylund and/or Hirukawa with respect to the limitations recited in Claim 28 and/or Claim 37. Appellants further submit that Masuhara et al. also fails to remedy the lack of disclosure of any of the previously cited references, taken alone or in any combination. As such, Appellants submit that the combination of Nylund, Hirukawa, Mori et al. and Masuhara et al. fail to teach or suggest instantly presented Claims 48 and 51. Accordingly, Appellants respectfully request withdrawal of the instant rejection.

IV. Rejection of Claims 44-46 under 35 U.S.C. §103(a) over Nylund, Hirukawa, and Shallenberger et al.

Claims 44-46 are rejected as allegedly obvious under 35 U.S.C. §103(a) over Nylund, Hirukawa, as applied to Claim 28 and further in view of U.S. Patent No. 4,800,061 to Shallenberger et al. (hereinafter referred to as "Shallenberger et al.").

In the Office Action, the Examiner states Nylund teaches a spacer and a sleeve but fails to teach that the sleeve has a thickness of the material, which is less than 0.24 mm, 0.20 mm or 0.18 mm. The Examiner remedies this deficiency by combining Nylund and Hirukawa with Shallenberger et al., which, according to the Examiner, discloses "a sleeve 70 that has a thickness of the material, which is less than 0.24mm (figures 7 and 8; column 8, lines 23-29, 46-51)." Office Action at p. 18. Regarding Claims 45 and 46, the Examiner also alleges that Shallenberger et al. discloses thicknesses of 0.20 mm and 0.18 mm. The Examiner concludes the instantly claimed invention would have been obvious to one of ordinary skill in the art in view of the combination of all the cited references.

Appellants respectfully disagree.

Claims 44-46 depend from Claim 36, which in turn depends from claim 28. Accordingly, Claims 44-46 include the limitations recited in independent Claim 28.

As discussed in detail above, all of the limitations of Claim 28 are not disclosed or suggested by Nylund and Hirukawa, taken alone or in any combination. Appellants submit that Shallenberger et al. does not remedy the lack of disclosure in Nylund and/or Hirukawa with respect to the limitations recited in Claim 28. As such, Appellants submit that the combination of Nylund, Hirukawa and Shallenberger et al. fail to teach or suggest instantly presented Claims 44-46. Accordingly, Appellants respectfully request withdrawal of the instant rejection.

V. Rejection of Claims 50 and 52 under 35 U.S.C. §103(a) over Nylund and Hirukawa and Masuhara et al.

Claims 50 and 52 are rejected as allegedly unpatentable under 35 U.S.C. §103(a) over Nylund and Hirukawa as applied to Claim 28 and further in view of Masuhara et al.

In the Office Action, with respect to claim 50, the Examiner states that Nylund teaches a spacer but fails to teach that the sleeve includes a slit, which extends from at least one of the upper edge and lower edge and which permits outward bending of a part of the sleeve for forming the vane. To remedy this deficiency, the Examiner combines Nyland and Hirukawa with Masuhara et al. According to the Examiner, Masahura et al. teaches "a spacer 6 wherein the sleeve 7 includes a slit (figure 2), which extends from at least one of the upper edge and lower edge and which permits outward bending of a part of the sleeve 7 for forming said vane (figure 2)." Office Action at p. 20.

With respect to Claim 52, the Examiner states that Masuhara et al. "teaches a vane 8 that extends outwardly from one of side (sic) of the sleeve 7. If the teachings of Masuhara are combined with the teaching of Nylund (i.e. the vanes, taught in Masuhara, constructed on the sleeve, taught in Nylund), the vane would necessarily extend outwardly from one of said long sides of the sleeve (Nylund) since the sleeve is a single piece." Office Action at pp. 20-21.

Thus, the Examiner concludes Claims 50 and 52 are obvious in view of the combined teaching of the cited art. Appellants respectfully disagree.

Claims 50 and 52 depend from Claim 47, which in turn depends from Claim 28. Accordingly, Claims 50 and 52 include the limitations recited in independent Claim 28.

As discussed in detail above, all of the limitations of Claim 28 are not disclosed or suggested by Nylund and Hirukawa, taken alone or in any combination. Appellants submit

that Masuhara et al. does not remedy the lack of disclosure in Nylund and/or Hirukawa with respect to the limitations recited in Claim 28. As such, Appellants submit that the combination of Nylund, Hirukawa and Masuhara et al. fail to teach or suggest instantly presented Claims 50 and 52. Accordingly, Appellants respectfully request withdrawal of the instant rejection.

VI. Rejection of Claims 55 and 56 under 35 U.S.C. §103(a) over Nylund, Hirukawa and Nylund (2)

Claims 55 and 56 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Nylund and Hirukawa as applied to Claim 28 and further in view of U.S. Patent No. 5,778,035 to Nylund (hereinafter referred to as "Nylund (2)").

In the Office Action, the Examiner states "Nylund teaches the spacer 7, but fails to teach that one of the four corners of the rectangular shape is reduced through the lack of outer sleeve, and that the spacer includes a separate inner edge element, which extends along tow of said sides and along said reduced corner." Office Action at p. 21. To remedy the deficiency of Nylund, the Examiner states that Nylund (2) "teaches a spacer 11 wherein one of the four corners of the rectangular shape is reduced through the lack of outer sleeve 7f, and that the spacer 11 includes a separate inner edge element a, b which extends along two of said sides and along said reduced corner (figure 6' column 6, lines 45-67)." Office Action at p. 21.

The Examiner concludes the combination of the cited references discloses or suggests the instantly claimed invention recited in Claims 55 and 56. Appellants respectfully disagree.

Claim 55 depends from Claim 54, which in turn depends from Claim 28. Claim 56 depends from Claim 55. As such, both Claims 55 and 56 include all of the limitations recited in Claim 28.

As discussed in detail above, all of the limitations of Claim 28 are not disclosed or suggested by Nylund and Hirukawa, taken alone or in any combination. Appellants submit that Nylund (2) does not remedy the lack of disclosure in Nylund and/or Hirukawa with respect to the limitations recited in Claim 28. As such, Appellants submit that the combination of Nylund, Hirukawa and Nylund (2) fail to teach or suggest instantly presented

Claims 55 and 56. Accordingly, Appellants respectfully request withdrawal of the instant rejection.

CONCLUSION

Appellants respectfully submit that the stated rejections of the pending claims have been shown to be unsustainable. Accordingly, Appellants respectfully request reconsideration and withdrawal of the outstanding rejections.

Appellants believe that no additional fees are due with the submission of this Appeal Brief. However, if an additional fee is due, Appellants authorize the payment of any additional charges that may be necessary to maintain the pendency of the present application to the undersigned attorney's Deposit Account No. 503342.

Respectfully submitted,

By /Richard R. Michaud/
Richard R. Michaud
Registration No. 40,088
Attorney for Assignee

Michaud-Kinney Group LLP
306 Industrial Park Road, Suite 206
Middletown, CT 06457-1532
Tel: (860) 632-7200
Fax: (860) 632-8269

(viii) CLAIMS APPENDIX

1-27. (Canceled)

28. (Previously Presented) A spacer for holding a number of elongated fuel rods intended to be located in a nuclear plant

the spacer enclosing a number of cells, each cell having a longitudinal axis and arranged to receive a fuel rod in such a way that the fuel rod extends substantially in parallel with the longitudinal axis,

each cell being formed by a sleeve, having an upper edge and a lower edge,

the sleeve including a number of elongated abutment surfaces, which project inwardly towards the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received in the cell, and

the lower edge, seen transversely to the longitudinal axis, having a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces;

wherein the upper edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces,

each of said elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge, and

the sleeves abut each other in the spacer along respective connection areas, each extending substantially parallel to the longitudinal axis between one of said wave valleys of the upper edge and one of said wave valleys of the lower edge.

29. (Canceled)

30. (Previously Presented) A spacer according to claim 28, wherein each sleeve includes at least four of said abutment surfaces.

31. (Previously Presented) A spacer according to claim 28, wherein each of said abutment surfaces is formed by a respective ridge projecting inwardly towards the longitudinal axis.

32. (Canceled)

33. (Previously Presented) A spacer according to claim 28, wherein the sleeves are permanently connected to each other by means of weld joints.

34. (Previously Presented) A spacer according to claim 28, wherein said sleeves are permanently connected to each other by means of weld joints, wherein said weld joints include an edge weld at said connection area at at least one of the upper edge and the lower edge.

35. (Canceled)

36. (Previously Presented) A spacer according claim 28, wherein substantially each sleeve is manufactured of a sheet-shaped material that is bent to the sleeve shape.

37. (Previously Presented) A spacer according to claim 36, wherein the sheet-shaped material before said bending has a first connection portion in the proximity of the a first end of the sheet-shaped material and a second connection portion in the proximity of a second end of the sheet-shaped material, wherein the first end overlaps the second end of the sleeve after said bending.

38. (Previously Presented) A spacer according to claim 37, wherein the first connection portion and the second connection portion are permanently connected to each other by means of at least one weld joint.

39. (Previously Presented) A spacer according to claim 38, wherein said weld joint includes a spot weld.

40. (Previously Presented) A spacer according to claim 28, wherein substantially each sleeve is manufactured from a tubular material which is worked to the wave shape of the upper edge and the lower edge.

41. (Previously Presented) A spacer according to claim 28, wherein the sleeve seen in the direction of the longitudinal axis has four substantially orthogonal long sides, wherein each long side includes one of said abutment surfaces.

42. (Previously Presented) A spacer according to claim 41, wherein each long side includes one of said wave peaks of the upper edge and one of said wave peaks of the lower edge.

43. (Previously Presented) A spacer according to any claim 41, wherein the sleeve, seen in the direction of the longitudinal axis, has four substantially orthogonal short sides, wherein each short side connects two of said long sides and includes a portion of one of said wave valleys of the upper edge and a portion of one said wave valleys of the lower edge.

44. (Previously Presented) A spacer according to claim 36, wherein the sleeve has a thickness of the material, which is less than 0.24 mm.

45. (Previously Presented) A spacer according to claim 36, wherein the sleeve has a thickness of the material, which is less than or equal to 0.20 mm.

46. (Previously Presented) A spacer according to claim 36, wherein the sleeve has a thickness of the material, which is less than or equal to 0.18 mm.

47. (Previously Presented) A spacer according to claim 28, wherein the nuclear plant is arranged to permit re-circulation of a coolant flow and wherein the spacer is arranged to be located in the coolant flow, the spacer including at least one vane for influencing the coolant flow.

48. (Previously Presented) A spacer according to claim 37, wherein the nuclear plant is arranged to permit re-circulation of a coolant flow, wherein the spacer is arranged to be located in the coolant flow, and wherein the spacer includes at least one vane for influencing the coolant flow, said vane being formed by a portion of the material, which extends from the first connection portion.

49. (Canceled)

50. (Previously Presented) A spacer according to claim 47, wherein the sleeve includes a slit, which extends from at least one of the upper edge and lower edge and which permits outward bending of a part of the sleeve for forming said vane.

51. (Previously Presented) A spacer according to claim 48, wherein said vane is inclined in relation to the longitudinal axis.

52. (Previously Presented) A spacer according to claim 47, wherein the sleeve seen in the direction of the longitudinal axis has four substantially orthogonal long sides, wherein said vane extends outwardly from one of said long sides.

53. (Canceled)

54. (Previously Presented) A spacer according to claim 28, wherein the spacer, seen in the direction of the longitudinal axis, has a substantially rectangular shape and includes at least two separate outer edge elements which extend along a respective side of the spacer.

55. (Previously Presented) A spacer according to claim 54, wherein one of the four corners of the rectangular shape is reduced through the lack of outer sleeve, and that the spacer includes a separate inner edge element, which extends along two of said sides and along said reduced corner.

56. (Previously Presented) A spacer according to claim 55, wherein the inner edge element includes a vane, which is located at said reduced corner and which is inclined upwardly and inwardly towards a centre of the spacer.

57. (Previously Presented) A fuel unit for a nuclear plant including a number of elongated fuel rods and a number of spacers for holding the fuel rods, wherein

each of the spacers enclose a number of cells, which each have a longitudinal axis and is arranged to receive one of said fuel rods in such a way that the fuel rod extends in parallel to the longitudinal axis,

each cell is formed by a sleeve, which has an upper edge and a lower edge,

the sleeve includes a number of elongated abutment surfaces, which project inwardly towards the longitudinal axis and extend substantially in parallel with the longitudinal axis for abutment to the fuel rod to be received in the cell;

the lower edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and wave valleys located between two adjacent ones of said abutment surfaces;

wherein the upper edge, seen transversely to the longitudinal axis, has a wave shape with wave peaks, which are aligned with a respective one of said abutment surfaces, and with wave valleys located between two adjacent ones of said abutment surfaces,

each of said elongated abutment surfaces extending from a respective one of said wave peaks of the upper edge to a respective one of said wave peaks of the lower edge, and the sleeves abut each other in the spacer along respective connection areas, each extending substantially parallel to the longitudinal axis between one of said wave valleys of the upper edge and one of said wave valleys of the lower edge.

(ix) EVIDENCE APPENDIX

None.

(x) RELATED PROCEEDINGS APPENDIX

None.